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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
 (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SNC-134.PCT	FOR FURTHER ACTION <small>See Form PCT/IPEA/416</small>	
International application No. PCT/CA2005/000242	International filing date (<i>day/month/year</i>) 23 February 2005 (23-02-2005)	Priority date (<i>day/month/year</i>) 23 February 2004 (23-02-2004)
International Patent Classification (IPC) or national classification and IPC IPC: F42B 12/78 (2006.01) , F42B 12/74 (2006.01) , F42B 10/02 (2006.01)		
Applicant SNC TECHNOLOGIES INC. ET AL		
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.		
2. This REPORT consists of a total of 3 sheets, including this cover sheet.		
3. This report is also accompanied by ANNEXES, comprising:		
a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 6 sheets, as follows: <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).		
<input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. 1 and the Supplemental Box.		
b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).		
4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application		
Date of submission of the demand 23 September 2005 (23-09-2005)	Date of completion of this report 28 June 2006 (28-06-2006)	
Name and mailing address of the IPEA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001(819)953-2476	Authorized officer E.R. Ring (819) 997-2767	

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000242**Box No. I Basis of the report**

1. With regard to the language, this report is based on:

- the international application in the language in which it was filed
 a translation of the international application into _____, which is the language of a
 translation furnished for the purposes of:
 international search (Rules 12.3(a) and 23.1(b))
 publication of the international application (Rule 12.4(a))
 international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- the international application as originally filed/furnished

- the description:

<input checked="" type="checkbox"/> pages <u>1 to 15, 18 - 20</u>	as originally filed/furnished
<input checked="" type="checkbox"/> pages* <u>16, 17</u>	received by this Authority on <u>27 June 2006 (27-06-2006)</u>
<input type="checkbox"/> pages*	received by this Authority on

- the claims:

<input type="checkbox"/> pages	as originally filed/furnished
<input checked="" type="checkbox"/> pages* <u>21 - 24</u>	as amended (together with any statement) under Article 19
<input type="checkbox"/> pages*	received by this Authority on
<input type="checkbox"/> pages*	received by this Authority on

- the drawings:

<input checked="" type="checkbox"/> pages <u>1/4 - 4/4</u>	as originally filed/furnished
<input type="checkbox"/> pages*	received by this Authority on
<input type="checkbox"/> pages*	received by this Authority on

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITYInternational application No.
PCT/CA2005/000242**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1 to 23</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>1 to 23</u>	YES
	Claims	<u>NONE</u>	NO
Industrial applicability (IA)	Claims	<u>1 to 23</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations (Rule 70.7)

D1: US4109581 (Six) 29 August 1978 (29-08-1978)

D2: US2303449 (Fleischmann) 01 December 1942 (01-12-1942)

Six in D1 discloses a projectile made from a soft iron alloy having a slightly concave portion behind the ogival portion of the projectile. The section to the rear of the concave portion has a greater diameter than the greatest diameter at the transition between the ogival portion on the concave portion.

Fleischmann in D2 discloses a jacketed steel bullet wherein the jacketing material has a specific gravity substantially the same as that of the body portion of the core of the bullet.

NOVELTY:

Claims 1 to 23 are considered novel in accordance with PCT Article 33(2) as none of the prior art discloses a projectile of the configuration and construction that is claimed.

INVENTIVE STEP:

Claims 1 to 23 are considered to contain an inventive step in accordance with PCT Article 33(3) as none of the prior art discloses a projectile that would lead a person skilled in the art to the subject matter of the instant claims.

INDUSTRIAL APPLICABILITY:

Claims 1 to 23 are considered to be industrial applicable in accordance with PCT Article 33(3) in that they define subject matter that is useful in a technical sense.

27 June 2006 (27.06.2006)

Thus in the depicted preferred embodiment there is a gap 15 separating the projectile jacket 11 and the frusto-conical portion 14 so that the two are not in continuous contact over the midsection portion of the projectile. In the preferred embodiment the gap 15 between the jacket 11 and the core 12 is filled
5 with air.

The point of commencement of the separation is shown in Figure 5 as coinciding with the juncture between the ogival front portion 10 and midsection of the core 12. This is slightly forward of the juncture between the ogival front portion of the jacket 11 and the commencement of the cylindrical portion of the
10 jacket 11 whereby the gap 15 is formed.

A short cylindrical section 16 of the core 12 extends rearwardly from the frusto-conical portion 14. The jacket 11 is in contact with the core 12 in this region so that this section serves as the principle driving band area. Over the cylindrical section 16, the jacket 11 will become fully engraved on firing.
15 Rearwardly of the short cylindrical section 16 is a shorter rearwardly-tapering end section 13 with an exterior complementary conical angle of approximately 83° or a 7° half-conical angle.

The projectile core 12 in its steel format is preferably made of hardened AISI 1038 steel, or other hard material with a Rockwell hardness of 45
20 or greater on the "C" scale to assist in improved penetration of hard targets. The jacket 11 of the projectile is preferably made of a ductile copper/zinc alloy or gilding metal containing approximately 90% copper and 10% zinc. The jacket 11 thickness in the driving band area of the preferred embodiment, and optionally everywhere is slightly thicker than that of conventional ball projectile
25 jackets, e.g. 0.635mm for a new 5.56 mm round as opposed to 0.559mm for a standard 5.56 mm ball round. The jacket 11 wall need not be of constant thickness. A thicker copper alloy jacket requires no additional special coatings or other special treatment to reduce friction and acts as a friction-reducing medium between the hard steel core 12 and the gun barrel.

30 The projectile is assembled with the jacket 11 in direct contact with the one-piece core 12 along the ogival front end 10, the short cylindrical section 16 and the rearwardly tapering end portion 13. However, by reason of the frusto-conical shape of the intervening middle portion 14 and the fact that the

jacket 11 is generally cylindrical in shape, particularly on its inside surface, there is a small separation or gap 15 between the projectile jacket 11 and the frusto-conical portion 14 of the core 12. The half-conical angle of the frusto-conical portion 14 is, for a 5.56 mm round, preferably 0.85° to 0.95°, but may preferably 5 range between 0.7° and 1.0°. This gap 15 allows the copper jacket material to flow plastically during engraving and without rupturing from no significant interference from the unyielding hard, steel core underneath, at least in the forward portion of the midsection. The deformation of the jacket 11 must be sufficient to maintain acceptable chamber pressure values, but not so great as to 10 hinder the transfer of spin to the projectile required for stability. The range of permitted angles for the tapered portion 14 of the core 12 is also important for ensuring the accuracy of the projectile in flight, but this is not the only factor involved.

The value of the angle of the frusto-conical portion is additionally 15 important since too large an angle could result in an unsupported ogival front end portion 10 whereby the projectile may not properly seat in the barrel. This can lead to an increase in projectile yaw in flight and reduced accuracy on the target. If the angle of the frusto-conical portion 14 is too small, the gap 15 will be too small and increase projectile engraving forces will arise.

20 Further, it is highly preferable that the length of the cylindrical parallel portion 16 be less than the length of the frusto-conical portion 14, preferably substantially less. The reason for this is as follows.

The ratio of the length of the short cylindrical section 16 of the core 12 to the longer frusto-conical section 14 is important for maintaining stability of 25 the projectile in flight. This ratio should be preferably less than one third, more preferably less than 0.3, ranging between 0.3 and 0.1, with best results obtained at a ratio of about 0.2 in 5.56mm projectiles. If the cylindrical parallel portion 16 is too long, excessive chamber pressure and barrel wear will result. If this portion 16 is too short, the projectile will slip in the gun barrel rifling and 30 diminish in stability in flight, thus affecting accuracy.

The section of jacketed projectile that acts as the main driving band area (over the cylindrical portion 16 of the core) is in continuous contact with the rifling, while the frusto-conical section 14 of the core 12 is only partially and

02 AUGUST 2005 02.08.05

Schedule A

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A jacketed projectile having front and rear ends separated by the length of the projectile and comprising:
 - a) an engravable jacket, and
 - b) a central core, the central core having a midsection portion which is not in continuous contact with the jacket over at least a portion of the midsection portion to allow engraving to occur on the jacket without full support from the core, wherein the midsection portion is tapered, tapering towards the front end of the projectile to allow for progressive engraving of the jacket when the projectile is fired through a rifled barrel.
2. A jacketed projectile as in claim 1 comprising a fully encircling gap between the jacket and the core along at least a portion of the length of the midsection portion of the core.
3. A projectile as in claim 2 wherein the encircling gap is in the form of a tapered gap present between the jacket and the midsection portion along at least a portion of the length of the midsection portion.
4. A projectile as in claim 2 wherein the encircling gap is in the form of a fully encircling tapered gap present between the jacket and the full length of the midsection portion.
5. A projectile as in any one of the preceding claims wherein the midsection portion is frusto-conical in shape.

08 AUGUST 2005 02.08.05

6. A projectile according to claim 5 wherein the half-conical angle of the frusto-conical portion of the core is between 0.7° and 1.0°.
7. A projectile according to claim 5 wherein the half-conical angle of the frusto-conical portion of the core is between 0.85° and 0.95°.
8. A projectile according to any one of the preceding claims comprising a short cylindrical portion of the core having an outer surface, the cylindrical portion extending rearwardly from the midsection of the core, wherein the jacket and outer surface of the cylindrical portion are in generally continuous contact with each other for the length of the cylindrical portion.
9. A projectile according to claim 8 wherein the cylindrical portion of the core is less than 30% of the length of the midsection portion.
10. A projectile as in any one of claims 2, 3 or 4 wherein the gap is occupied by a compressible medium.
11. A projectile as in claim 10 wherein the compressible medium is air.
12. A projectile as in any one of the preceding claims wherein the central core is principally composed of a material selected from the group consisting of carbon steel, tungsten, tungsten carbide, tungsten alloys, tungsten-nylon compounds, tungsten-tin compounds and mixtures thereof.
13. A projectile as in claim 12 wherein the central core has a hardness and the hardness of the central core is at least 45 on the Rockwell C hardness scale.
14. A projectile as in claim 1 wherein the core comprises a forward portion mounted ahead of the midsection, said forward portion having an ogival shape over at least a

02 AUGUST 2005 02.08.05

portion of its surface and wherein the junction between the forward and the midsection portions provides a relatively smooth transition zone.

15. A projectile as in claim 14 comprising an inwardly tapering end portion of the core positioned rearwardly of the cylindrical portion.
16. A projectile as in claim 15 wherein the rearwardly tapering end portion of the core has a half-conical angle of about 7 degrees.
17. A projectile as in any one of the preceding claims wherein the jacket material comprises gilding metal.
18. A projectile in accordance with claim 17 wherein the gilding metal jacket comprises approximately 90% copper and 10% zinc.
19. A projectile according to claim 18 wherein the gilding metal jacket is thicker than that normally used on conventional ball projectiles of similar calibre.
20. A projectile according to any one of the preceding claims in combination with a casing to form a cartridge, the casing being dimensioned to fit into a standard firearm wherein the overall length of the projectile is greater than that of a conventional ball projectile of similar caliber and wherein the projectile, when fitted into its casing, provides a cartridge with a length suited to fit into a standard firearm having a casing of the same diameter.
21. A projectile and casing combination in the form of a cartridge as in claim 20 wherein said cartridge is free of toxic components.
22. A projectile and casing combination in the form of a cartridge as in claim 20 wherein said cartridge is lead-free.

PCT/CA 2005/000242

02 AUGUST 2005 02.08.05

23. A jacketed projectile as in any one of the preceding claims wherein the central core is a solid, one-piece core.